Importance of Space Biology

Curricular Unit
Student Materials

OVERVIEW

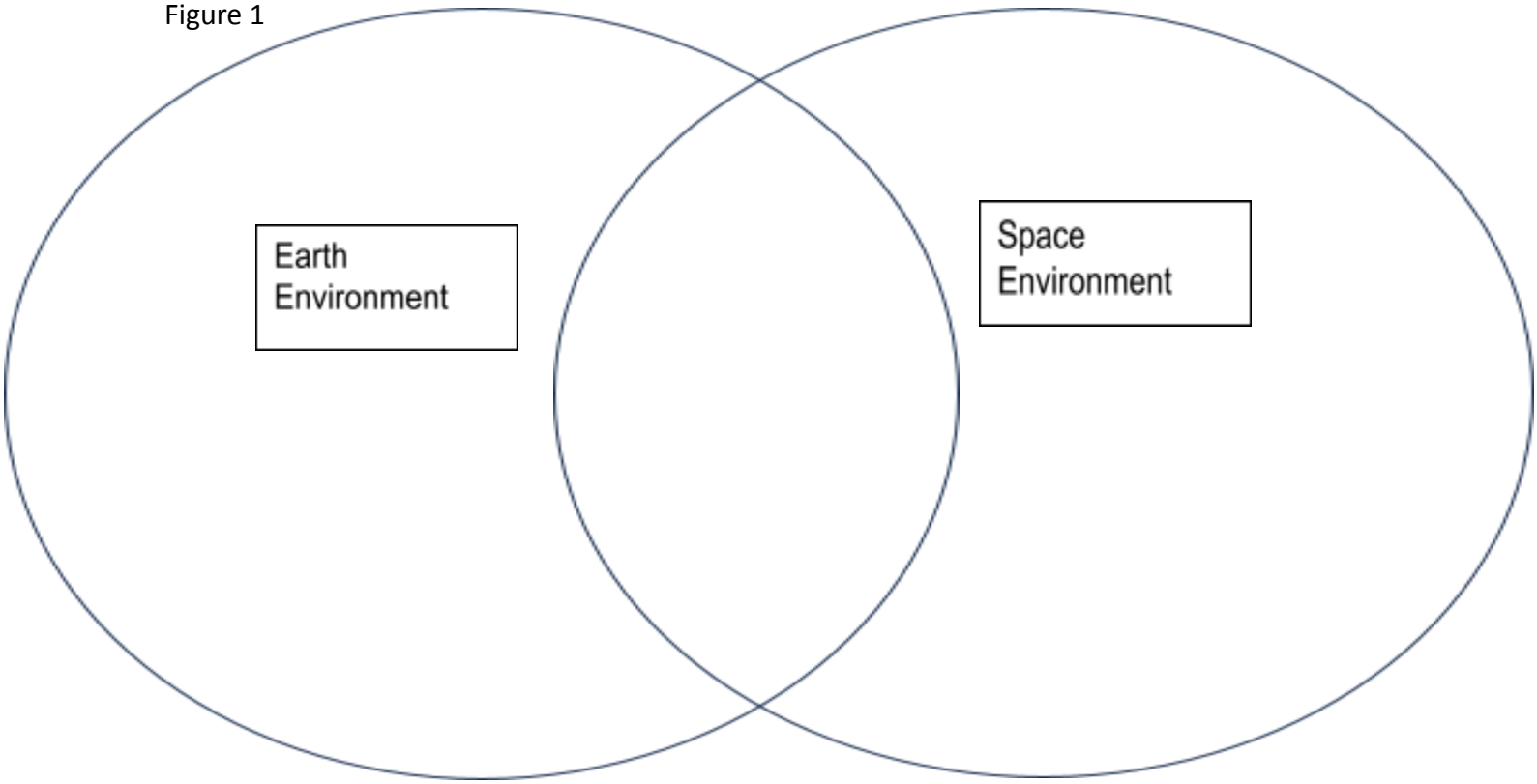
This unit will provide students with a general understanding of space biology and why it is an important area to study. You will compare the environments on Earth and space by learning about the International Space Station. You will explore facets of space biology and learn about current and future goals from NASA and private space industries. You will research the effects of long-term exposure to space on the human body. You will be exposed to the wide variety of careers available in space biology and what you would need to do to have one of these STEM jobs in the future.

Engage

Objective: Compare and contrast the difference between the Environment in space vs Earth.

1. Watch ISS tour video: https://www.nasa.gov/mission_pages/station/main/suni_iss_tour.html
2. Web Extra: International Space Station Tour: https://www.youtube.com/watch?v=AErpXJq67LM
3. Visit the ISS using GoogleEarth https://earth.google.com/web/@20.97007048,-71.07418407,-3156.89791739a,16580443.11132057d,35y,356.00012934h,0t,0r/data=Ci4SLBIgN2Y3ZTA1ZTg2Y2E1MTFlNzk5YzI1YjJmNTFhNjA3NTIiCG92ZXJ2aWV3
4. 25-minute tour of the International Space Station with astronaut Sunita Williams: https://thekidshouldseethis.com/post/international-space-station-tour-iss

Figure 1



Explore

Objective: Explain space biology and why it is important.

Directions: Read the following articles and watch the video. Complete the chart (Figure 2).

- "What We Study: Space Biology Overview (https://science.nasa.gov/biological-physical/focus-areas)
- "Space Biology Program Overview" (https://science.nasa.gov/biological-physical/programs/space-biology#:~:text=The%20overarching%20goal%20of%20Space,molecular%20biology%20techniques%20and%20measures)
- Learning about Space Biology (https://www.youtube.com/watch?v=P-FKMqSmbBk)

Figure 2

Topic	Claim	Evidence	Reasoning
Space Biology Overview			
Animal Biology			
Cell and Molecular Biology			
Microbiology			
Plant Biology			
Developmental, Reproductive, and Evolutionary Biology			

Explain

Objective: Examine stresses that the human body faces in space and the long-term effects this could have on life.

Directions: Use the objective to guide you as you work through each resource. Summarize what you have learned in the space provided.

Resources:

1. Watch the video Our Bodies in Space: Zero Gravity weighs heavy on your health https://www.cnn.com/2016/05/20/health/your-body-in-space/index.html
2. Read Human Research: Studying Astronaut Physiology https://www.nasa.gov/mission_pages/station/research/benefits/human-research-studying-astronaut-physiology as a whole group.
3. Read The Human Body in Space Introduction and figure What happens to the Human Body in Space https://www.nasa.gov/hrp/bodyinspace as a whole group.

Summaries

1. Our Bodies in Space: Zero Gravity Weighs Heavy on Your Health

2. Human Research: Studying Astronaut Physiology

3. The Human Body in Space Introduction

4. Space Radiation

5. Isolation and Confinement

6. Distance from Earth

7. Gravity Fields

8. Hostile/Closed Environments

Extend

Objective: Analyze what is currently happening with space biology.

Directions: Watch the videos about current space biology research and complete the table (Figure 3). Then go to NASA Space Missions, select a mission, and answer the questions.

Resources:

- Genes in Space (https://www.genesinspace.org/educational-videos/)
- NASA Science Space Missions (https://science.nasa.gov/missions-page?field_division_tid=11253)

Figure 3

Research	Goal/Overview	Applications
Fresh Food for the Ride to Mars		
Microbes on the International Space Station		
Skeleton in Space		
The Search for Life on Far Away Planets		
Heart Cells Beating in Orbit		
Genetic Data from Space		

NASA Space Missions

1. What is the name of the mission?
2. What is the goal of the mission?
3. Why is the mission important?
4. What are the space and Earth applications?
5. What were some investigations that occurred and what were their outcomes?
6. What were some similarities and differences between your partner's and your mission?

Evaluate

Objective: Explain the future of space biology. Research some career paths in space biology.

Directions: Conduct research about Artemis and different careers in space biology. Answer the following questions.

Resources:

Artemis Mission (https://www.nasa.gov/specials/artemis/)

Careers in Space (https://www.bls.gov/careeroutlook/2016/article/careers-in-space.htm)

Artemis

1. Why are we going to the moon?

2. How are we going to the moon?

3. Research each category and give a summary.
    a. Orion SpaceCraft

    b. Space launch System Rocket

    c. Exploration Ground Systems

    d. Gateway

    e. Human Landing System

    f. Artemis Base Camp

Space Biology Careers

1. What space biology career did you choose?

2. What kind of work do people in this career do?

3. What education or experience is needed for this career?

AUTHOR

Brie Logan, 21st Century Public Academy (Albuquerque, NM)

Edited by GL4HS Staff